Title: Seasonal Variation in Avifauna with Respect to Habitat Changes in the Pokkali Fields of Ernakulam District, Kerala.

Final Synopsis submitted by: DEEPA K.M.

Introduction

Seasonal fluctuation in the abundance of a species is considered as an adaptive phenomenon evolved through ages to derive maximum advantage from the ambient environmental conditions (Koen, 1992).

The species composition of birds varied depending on the season of the year. Availability of microhabitats and various food resources were the determining factor which control the seasonal changes of bird species composition. Peak population of birds were noticed during the migratory season and a decrease was recorded during non migratory season (Acharya, 2000). Environmental factors determine the wetland bird community primarily by their direct or indirect impact on the availability and abundance of bird prey. The role of abundance of food on wetland bird density has been well established by Nagarajan and Thiyagesan (1996).

Seasonal variation of avifauna with respect to habitat changes in the pokkali fields of Ernakulam (District) Kerala was studied from May 2006 to April 2009. The pokkali wetlands lie between 10^{o} 01′ 53″N and 10^{o} 4′ 21″ N latitude and 76^{o} 14′ 25. 7″ – 76^{o} 16′ 46″ N longitude with an extend of 4050 hectare spread over Trichur, Alappuzha and Ernakulam district of Kerala state. The term pokkali refers to a saline resistant rice variety largely cultivated in these Ernakulam district. Pokkali in local language (Malayalam) means the one who stays tall.

Paddy-fish / prawn culture has been considered as an ideal method of land use and has been practiced in Asia for several centuries. Pokkali lands are known after the renowned pokkali rice cultivar which is internationally accepted as gene donor for salt tolerance in rice. The farming system now followed in the pokkali land is internationally acclaimed as a sustainable system. The integration of rice and prawn rotationally with the change in the field water salinity augurs well with the system of nature (Sasidharan, 2004). Pokkali is a unique variety of rice that is cultivated in an organic way in coastal areas and it is one of the most eco friendly farming practices in the world. There is no need of chemical pesticide and

fertilizers for high yield. This method which has been passed down from generation to generation relies on the symbiotic nature of prawn and rice. The organically grown pokkali is famous for its peculiar taste and its high protein content and has several medicinal properties. Pokkali wetland is important for birds due to its habitat diversity , food resources, ecofriendly farming practices, lesser disturbances etc (Tomy *et al.* 1984).

The present study conducted during 2006-09 is considered as the first long term study related to avifauna in Kerala.

Climate of the area is wet monsoon type. The temperature varies from 26 ^{0}C to 35 ^{0} C and the average annual rainfall is 3600 mm and the maximum rainfall is received during June and July months.

The main objectives of the studywere (1) to study the avifauna of pokkali wetland area (2) to study the seasonal variations in the avifauna of pokkali wetland (3) to study the habitat changes taking place in pokkali wetland and (4) to study the variation in the physico-chemical parameters of air, water, soil, major flora and fauna with respect to habitat changes.

Birds were studied based on direct observation method (Altman, 1974). Point count and line transect methods were also followed. Five intensive study areas were selected for detailed observations. Bird population was estimated by total count method (Hoves and Bakewell, 1989). Species richness, abundance, diversity index, density, seasonal fluctuation of bird community, food, habitat utilization of wetland birds were recorded and analyzed using statistical package. Standard methods were used to study the physicochemical parameters (APHA, 1996), flora (Quadrate method, Clements and Weaver, 1971) and fauna (Fish and Bird only). Sample collections were made from five study areas namely Kuzhuppilly, Kumbalangy, Cheranelloor, Edavanakad and one intensive study area namely Kadamakudy.

Three types of habitats are mainly noticed in pokkali wetland. They are paddy cultivated fields (June-October), prawn culture farms (January-May) and a short transient period (November-December) in between. The agricultural/farming activity of pokkali wetland is a cyclic process in which paddy cultivation season (June-October) is followed by transient period (November-December) and prawn farming season (January-May). The transient period is having only a short duration (about 60 days).This period is also important as many birds are attracted to the habitat during this period. Here a comparison is made

between the two major cultivation/culture seasons namely paddy cultivation and prawn culture seasons.

The first chapter is the introduction part which mostly deals with the wetlands and their importance, pokkali cultivation and their importance, major objectives of the present study and brief description of different study areas.

Review of literature is included in the second chapter. Review of studies related to wetlands, water and soil, aquatic macrophytes, fishes and avifauna are included in this chapter.

The third chapter deals with the study of the physicochemical properties of air, water and soil of pokkali wetlands of Ernakulum district were carried out during 2006-09. Dissolved oxygen, water p^H , soil p^H , water temperature ,water depth and salinity during different months were discussed in this chapter.

The fourth chapter deals with the study of the aquatic macrophytes of pokkali wetlands of Ernakulam district ,carried out during May 2008- April 2009. A total of 100 species of plants belonging to 52 families were recorded from the study area.

The fifth chapter deals with the fish/shell fish fauna of pokkali wetland during May 2008 to April 2009. Pokkali wetland supports 50 species of fishes belonging to 30 families and 11 orders and five shell fishes. Among the fishes eight species were secondary fresh water fishes.

The sixth chapter deals with the present status and population of avifauna of pokkali habitat. A total of 119 species of birds belonging to 44 families and 18 orders and were recorded during the study. Among these 84 species were residents, 35 species were migrants. Among the migrants 30 species were transcontinental migrants and five were local migrants. Three near threatened species namely Spot billed Pelican (*Pelycanus philippensis*), Darter (*Anhinga melanogaster*) and Oriental White Ibis (*Threskiornis melanocephalus*) were also recorded.

The abundance, density, diversity of birds during different seasons of study period is also included in this chapter.

The seventh chapter deals with the habitat changes of pokkali wetlands during different seasons. The changes in the physicochemical parameters of water, vegetation, fish fauna and avifauna during different seasons are discussed in this chapter.

The increase in the wetland bird species from October to May in all years reflected the availability of ideal microhabitats and higher production of benthic and macro fauna. The area served as ideal habitat for many avian species for a wide variety of purposes such as feeding, nesting, roosting and wintering. The appearance of mudflats in the habitat attracted large number of waders during prawn culture season.

The integrated organic ecofriendly rotational paddy –fish/prawn culture in pokkali wetlands is an ideal habitat for migratory and resident birds. In the present study 30 species of transcontinental migrants were recorded from the pokkali wetlands, which showed the importance of the area as a wintering ground for migratory species. This wetland supported waders, shore birds similar to the known sites such as Chilika lake, Pulicat lake, Great Vedaranyam Swamp, Point calimer Vembanad lake and Kole wetlands (Manakadan and Sivakumar 2004, Sugathan, 1982, Narayan *et al.* 2011 and Sivaperuman and Jayson, 2001).

The loss of habitat and destruction through direct and indirect anthropogenic activities is the main threat to the birds especially migrant birds of pokkali wetlands. The shrinking of pokkali rice cultivation vanishing mangroves, increased human interventions in the area like dumping of domestic wastes and industrial wastes into pokkali rice / prawn farm, construction of buildings in pokkali wetland area, land reclamation, land alteration, over exploitation of fishes, overgrazing, poaching of birds etc are some of the problems related to habitat loss affecting the pokkali wetland birds.

As pokkali wetlands come under the central Asian flyway and part of the Vembanad Ramsar site in India, this area should be declared as an important bird area (IBA) for the protection of the many migratory bird species.

References.

1. Acharya, S. (2000): Studies on some ecological aspects of shorebirds (Family: Charadriidae) with species reference to plovers of Nalabana Island, Chilika Lagoon, Orissa. Ph.D. Thesis, Utkal University, Bhubaneswar, Orissa. 177pp.
2. Aji S. (1969). The Birds of Kerala, Oxford University Press, Bombay.

3. Altmann, 1974: Observational study of behaviour : sampling methods. *Behaviour 49*: 227 – 267.

4. APHA (1996): Standard methods for the examination of water and waste water 6th edition. American Public Health Association, Washington D.C

5. Manakadan, R. and S. Sivakumar. (2004): An ecological account of faunal diversity of Sriharikota Island and its environs. Final Report: Part I - Birds and Mammals. *Bombay Natural History Society*,Mumbai. 46 pp.

6. Nagarajan, R. and K. Thiyagesan. (1996): Water birds and substrate quality of the Pichavaram Wetlands, Southern India. *Ibis* 138 : 710 – 721 pp.

7. Narayan, S. P., A. P. Thomas and B. Sreekumar.(2011): Ornithofauna and its conservation in the Kuttanad wetlands, southern portionof Vembanad-Kole Ramsar site, India. *Journal of Threatened taxa* 3(4): 1663-1676.

8. Sasidharan, N. K (2004): Enhancing the productivity of the rice, fish/prawn farming system in pokkali lands. Ph.D thesis. Dept. of Agronomy. College of Horticulture, Vellayanikkara, Trichur, Kerala.

9. Sivaperuman C. and Jayson E.A. (2001). Structure and species composition of wetland birds in the Kolelands of Thrissur, Kerala. Proceedings of the Thirteenth Kerala Science Congress, January 2001, Thrissur. Pp. 152-155.

10. Sugathan R. (1996). Checklist of Birds of Nine Sanctuaries and National Park of Kerala. Kerala Forest Department (Wildlife).

11. Sugathan, R. (1982): Ecology of Thattakad Bird Sanctuary. Annual Report. Kerala Forest Department (Wildlife).

12. Tomy, P.J; George T.U. and Suseela Jose. (1984): Pokkali Cultivation in Kerala. *Technical bulletin -10,* K.A.U. Trichur, Kerala 1-20 pp.